Q.P. Code: 16CS507 **R16**

Reg. No: | | | | | | | | | | |

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR

(AUTONOMOUS)

B Tech II Year I Semester Supplementary Examinations Nov/Dec 2019

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

(CSE & CSIT)

Time: 3 hours Max. Marks: 60

(Answer all Five Units **5 x 12 = 60** Marks)

UNIT-I

1 **a** Using replacement process, Prove that $P \to (Q \to P) \Leftrightarrow \neg P \to (P \to Q)$. **5 M**

b Prove that $(\exists x)\,(P(x) \wedge Q(x)) \Rightarrow (\exists x)\,P(x) \wedge (\exists x)\,Q(x)$. **7 M**

OR

2 **a** Show that $S \vee R$ is a tautologically implied by $(P \vee Q) \wedge (P \to R) \wedge (Q \to S)$. **7 M**

b Show that $((P \to Q) \to Q) \Rightarrow P \vee Q$ without constructing truth table. **5 M**

UNIT-II

3 **a** Determine A/R, when A = {1, 2, 3, 4} and R = {(1, 1), (1, 2), (2, 1), (2, 2), (3, 4), (4, 3), (3, 3), (4, 4)} be an equivalence relation on R. **6 M**

b The necessary and sufficient condition for a non-empty sub-set H of a Group $(G,*)$ to be a sub group is $a \in H,\ b \in H \Rightarrow a * b^{-1} \in H$. **6 M**

OR

4 **a** If $f : R \to R$ such that $f(x) = 2x + 1$ and $g : R \to R$ such that $g(x) = x/3$ then verify that $(g \circ f)^{-1} = f^{-1} \circ g^{-1}$. **7 M**

b On the set Q of all rational numbers with operation * is defined by $a * b = a + b - ab$. Show that this operation on Q forms a commutative monoid. **5 M**

UNIT-III

5 **a** Consider a set of integers from 1 to 250. Find how many of these numbers are divisible by 3 or 5 or 7. Also indicate how many are divisible by 3 or 7 but not by 5 and divisible by 3 or 5. **6 M**

b Out of 9 girls and 15 boys how many different committees can be formed each consisting of 6 boys and 4 girls? **6 M**

OR

6 **a** How many solutions does the equation $x_1 + x_2 + x_3 = 17$ have, subject to the constraints (*i*) x_1, x_2, x_3 are non-negative integers. (*ii*) $x_1 \geq 1,\ x_2 \geq 2$ and $x_3 \geq 3$. **6 M**

b How many ways can the letters of the word "MATHEMATICS" are arranged. **6 M**
(*i*) How many of them begin with M and end with S.
(*ii*) How many of them do not begin with M but end with S.

UNIT-IV

7 **a** Obtain the sequence generated by $(i)\ f(x) = 2e^x + 3x^2$ $(ii)\ f(x) = 7e^{8x} - 4e^{3x}$ **7 M**

b Solve the recurrence relation using generating functions $a_n - 9a_{n-1} + 20a_{n-2} = 0$ for $n \geq 2$ and $a_0 = -3,\ a_1 = -10$. **5 M**

OR

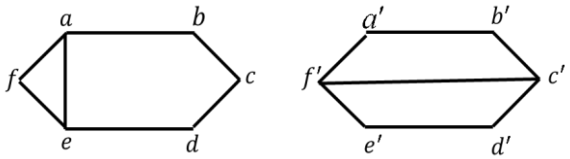
8 **a** Solve $a_n - 9\,a_{n-1} + 20\,a_{n-2} = 0$ with initial conditions $a_0 = -3,\ a_1 = -10$. **5 M**

b Solve the recurrence relation $a_{n+2} - 2a_{n+1} + a_n = 2^n$ with initial condition $a_0 = 2$ and $a_1 = 1$. **7 M**

UNIT-V

9 **a** Let G be a 4 – Regular connected planar graph having 16 edges. Find the number of regions of G. **6 M**

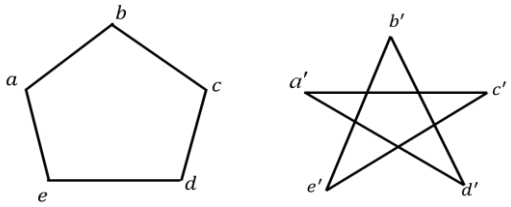
b Verify the following pairs of graphs are isomorphic or not ? **6 M**



G_1 G_2

OR

10 **a** Identify whether the following pairs of graphs are isomorphic or not? **6 M**



G_1 G_2

b Draw the graph represented by given Adjacency matrix **6 M**

(i) $\begin{bmatrix} 1 & 2 & 0 & 1 \\ 2 & 0 & 3 & 0 \\ 0 & 3 & 1 & 1 \\ 1 & 0 & 1 & 0 \end{bmatrix}$ (ii) $\begin{bmatrix} 1 & 0 & 2 & 1 \\ 0 & 1 & 1 & 2 \\ 2 & 1 & 1 & 0 \\ 1 & 2 & 0 & 1 \end{bmatrix}$.

*** END ***